Variability of airborne particle metrics in urban area

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People living in urban environments are often exposed to particle concentration levels exceeding the PM10 standards established by the European directive (Directive 2008/50/EC). Airborne particle concentration levels in cities are mostly related to anthropic urban activities/sources (such as transportation and heating).These sources are characterized by combustion processes mainly producing high levels of sub-micrometric and ultrafine particles (UFPs, particles with diameter smaller than 100 nm). Clinical and toxicological studies have shown a link between the exposure to high particle concentration levels and adverse health effects. That is a reason why is crucial a characterization of the exposure to the different metrics of the airborne particles (number, surface area, mass, black carbon content, carcinogenic compound content) in cities. Recent studies have demonstrated that measurements performed using fixed monitoring stations do not provide adequate input into the assessment of population exposure to airborne particles. To overcome this limitation, the use of mobile monitoring platforms (bikes, buses, etc.), equipped with cutting edge instruments which allow real-time collection of air quality data, is getting a foothold in the scientific field. In particular, these systems (platforms with onboard instruments) allow the spatial and temporal characterization of air quality in urban microenvironments. In the present study the mobile monitoring approach was applied to investigate the spatial variability of all the key airborne particle metrics (number, alveolar-deposited surface area, mass concentrations) in an Italian urban area. Streets characterized by exposure levels statistically higher than the background levels for all the particle metrics were identified for different seasons, meteo-climatic and traffic conditions. A higher number of hot spots was measured for metrics affected by ultrafine particles (number and alveolar-deposited surface area

concentrations) with respect to PM10. The effect of metrological requirements of the instrumentation on the proposed method was also discussed.